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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1016.

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FIRST VOYAGE OF THE ST. LOUIS.

The American Line steamer St. Louis completed her maiden voyage at 4:45 A. M., Thursday, June 13. The actual time from Sandy Hook to the Needles, a cluster of three pointed rocks in the English Channel, west of the Isle of Wight, was 7 days, 3 hours and 53 minutes. The vessel was delayed five hours by fog. The engines are capable of making 95 revolutions a minute, and for a time, on the trial trip, their speed was increased to 98 revolutions, but on the voyage the engines made only 76 to 84 revolutions per minute. One peculiarity about the new engines is the smoothness with which they run, as, according to the reports of the passengers, at no time or in any part of the ship was the vibration sufficient to enable any one to count the revolutions of either of the screws. During the first few days some difficulty was experienced with the ventilating apparatus, but this was overcome. The daily runs of the St. Louis were 314, 443, 431, 441, 433, 432, 416, and 249 knots, the average speed being 18·38 knots. For a first voyage, this is considered highly satisfactory. The arrival of the St. Louis at Southampton gave occasion for public rejoicing. The event is to be further celebrated by special festivities.

THE CHUPADEROS METEORITE.

The great Chupaderos meteorite, which was discovered broken in two immense pieces in 1581, may now be seen at the portal of the National School of Mines, in the city of Mexico. One piece has been placed at each side of the courtyard entrance. The huge, irregular masses have the appearance of brown hematite iron ore, but at points where they have been chipped or filed the common meteoric striations are plainly recognizable. The smaller piece is 7 feet long, 3 feet 7 inches wide, and 1 foot 8 inches thick, and weighs 20,450 pounds. The larger is 8 feet 2 inches long, 6 feet 7 inches wide, and 1 foot 4 inches thick, and weighs no less than 34,400 pounds. The dimensions given are, of course, averages, as the specimens are exceedingly uneven and are full of trilobite depressions or "pot holes."

The form of the two pieces leaves no room for doubt that they were originally parts of one great meteorite weighing more than 27 tons. The density has been calculated at 7·8.

The two sections were found 800 feet apart, at a point 900 miles from the city of Mexico. More than four centuries later, in 1893, they were carried to that city and placed in their present position.

THE SCIENTIFIC AMERICAN AS AN ADVERTISING MEDIUM.

Referring to our advertising columns, we call attention to the announcement of Mr. Layman, inventor of the Outing Boat, and to a cablegram order for boats therein presented, from the Grand Duke Alexander of Russia. His Highness, it appears, is a reader of the SCIENTIFIC AMERICAN; hence his order to the American boat maker.

There is no doubt the SCIENTIFIC AMERICAN is the most carefully read and most widely distributed paper of its class in the world. It reaches every nook and corner of the globe. The array of manufacturing industries, of which announcements are presented in every number, proves how very valuable the paper is as an advertising medium. Mr. Layman states that the SCIENTIFIC AMERICAN brought him over two thousand correspondents, and he adds the paper "has been a wonderful help to me in building up my business." We have no doubt hundreds of other advertisers could testify to similar benefits received.

FORCE EXERTED BY THE HUMAN JAWS.

Dr. G. V. Black, a dentist of Jacksonville, Florida, has made some interesting experiments upon the force exerted by the human jaws in the ordinary mastication of food, and also the greatest force which the jaws are capable of exerting.

By means of a spring instrument provided with a registering device he took records of about 150 "bites" of different persons. Of these, fifty have been preserved as characteristic of the ordinary man, woman and child. The smallest pressure recorded was 30 pounds, by a little girl seven years old. This was with the incisors. Using her molars, the same child exerted a force of 65 pounds. The highest record was made by a physician of thirty-five. The instrument used only registered 270 pounds, and he simply closed it together without apparent effort. There was no method of determining how far above 270 pounds he could have gone. This test was made with the molars. Several persons exceeded a force of 100 pounds with the incisors and 200 with the molars. The physical condition of the persons experimented upon seemed to have little bearing upon the result. Dr. Black is of the opinion that the condition of the peridental membranes is the controlling factor, rather than muscular strength.

Dr. Black found that, in the habitual chewing of food, much more force is exerted than is necessary. In chewing a piece of beef steak, the crushing point of which was from 40 to 45 pounds, from 60 to 80 pounds stress was actually employed at each thrust of the teeth. The principal articles of food tested had crushing points as follows: Steak, 40 to 45 pounds; mutton chops, 35 to 40 pounds; broiled ham, 45 to 60 pounds; roast beef, 45 to 60 pounds; pork chops, 20 to 25 pounds, and the choicest parts of cold boiled beef tongue, 3 to 5 pounds. The tougher parts of beef and mutton required a crushing force of 90 pounds in some instances.

IRON WORKING AMONG PRIMITIVE PEOPLES.

Dr. Ludwig Beck, of Germany, in his recent work on the history of iron, gives some interesting information in regard to the furnaces, tools, and implements used by the savage races of Africa and Asia. The iron ore used by the African smith is usually hematite, which is found in great abundance. His furnace is of clay with four draught openings at the bottom through which air pipes are inserted. The furnace is about four feet high and will produce a lump of excellent iron in forty hours.

The Bango and Bataka tribes handle the white hot metal with tongs made of green wood held together by an iron ring. Their anvil is a square stone with a top as flat as possible, and another stone does service as a hammer. With the Kaffirs the process is even less complicated than this. The iron is not formed in a lump, but the drops of molten metal are allowed to cool, and are afterward picked out of the slag separately. The larger ones are hammered out flat between two stones, and a little heap is built up with the flat pieces outside and the small pellets packed between them. This is then given a welding heat and forged.

The Zulus make excellent assegais, beautifully polished with bark and ground to the keenest of edges upon a coarse stone. The African smiths have no vises, but hold the implements they are making between their feet, leaving both hands free to use such tools as they possess.

The natives of Borneo and Sumatra have brought the art of iron and steel making to a high degree of perfection. The furnace commonly used in Borneo is of yellow clay, strengthened with rings of bamboo. It is about 3 feet high and 10 feet in outside diameter. The walls are 2 feet thick. The blast apparatus consists of an upright wooden cylinder open at the top and closed at the bottom, where a valve connects it with bamboo pipes leading to the furnace.

The cylinder is fitted with a plunger, which is moved downward by hand and upward by a spring pole to which it is fastened.

The iron ore is roasted about twelve hours in a wood fire and then broken into small pieces and mixed with ten times its volume of charcoal for smelting. When a lump of iron is finally produced it is taken out of the furnace with wooden tongs and hammered with wooden mallets. It is then cut into small pieces and hammered again until the slag is driven out, and a very good grade of soft steel remains. The waste is said to be one-third.

THE COMMERCIAL VALUE OF MONAZITE.

It begins to look as though the great value of monazite mining lands had been very much overestimated. There is, of course, a demand for rare earth oxides for the manufacture of incandescent gas lamps, etc., but the supply of monazite is, unfortunately for the speculator, practically unlimited, and its price has dropped correspondingly.

Monazite (from μονάζειν, to be solitary) was so called in allusion to its supposed rarity. For a long time subsequent to its discovery in Norway it was believed to exist nowhere else. It was afterward found, however, in Silesia, Bohemia, Belgium, England, Brazil and the United States. The deposits in this country are near Norwich, Conn., and in North Carolina. Monazite is in substance a phosphate of cerium, lanthanum and didymium, containing silicon and thorium in variable proportions, probably as impurities. The oxides of the rare earth metals, cerium, thorium, yttrium, erbium, lanthanum and zirconium possess the peculiar property of becoming incandescent at a moderate heat. The light emitted is the greatest in the case of thorium, and this oxide of this metal is obtained principally from monazite. It is used extensively in the Welsbach lamp, where a network mantle of the oxide is suspended over a Bunsen burner and produces an intense white light.

When monazite was discovered in North Carolina, great excitement prevailed for a time. Fabulous stories of the value of the resinous-looking substance were circulated and sand from the river bottoms was carefully washed over in cradles like those used by the gold prospectors of California. Some of the pioneers made a good deal of money at first, but, as the washing process is exceedingly laborious and slow when conducted by hand, and many tons of sand must be washed to extract one of monazite, nobody got rich. Nevertheless the people all believed firmly that immense fortunes could be made with proper apparatus for mining, and chemists and engineers in the Northern cities were overwhelmed with letters and circulars in which monazite lands were offered as great bargains at absurdly high prices.

Meanwhile the representatives of the consumers had quietly placed contracts at the lowest possible figure and the price of the mineral began to drop. As last winter was a severe one and the ice in the rivers interfered with the washing, good, clean monazite sand sold for fifteen cents a pound. Now it can be had for five or six cents, and there is not a great demand at that. It is doubtful whether the entire output of North Carolina since the discovery of the mineral has brought $125,000.

SOME FACTS ABOUT GLASS.

The most scientific glass workers of to-day are no more proficient in their art than were the craftsmen of ancient Thebes 4,000 years ago. These remarkable artisans, many of whom were priests high in authority, were well acquainted with glass staining, and displayed the highest artistic skill in their tints and designs. The colors were perfectly incorporated with the structure of the vitrified substance and were equally clear on both sides. The priests of Ptah, at Memphis, had a factory for the manufacture of ordinary glass, and also devoted their attention to imitating precious stones, succeeding so well that specimens now found require an expert to distinguish them from the real gems. They were also acquainted with the use of the diamond for cutting glass. A specimen of beautifully stained glass, now in the British Museum, has the cognizance of Thothmes III engraved upon it.

Spun glass was first brought into practical use about fifty years ago by Jules de Brunfaut, a French chemist, although the art of spinning glass was practiced long before that time. He made a thorough study of the subject in Vienna. He first succeeded in softening the hard, shiny effect of the glass fabric, giving it a silky effect that was much more pleasing. Next he endeavored to reduce its brittleness by making a spun glass, whose threads were much finer than those of silk, and whose texture was much like that of wool. This glass could readily be woven and all kinds of articles were made of it. Among other things it was found especially suitable for surgical use, owing to its antiseptic properties and its cleanliness. The fact that glass is unattacked by most acids made the fabric useful for laboratory filters, and nearly all well equipped establishments of the kind now use them. The cloth is, besides, non-combustible and a poor conductor of heat. As the individual fibers are perfectly non-absorbent, grease spots and stains can be readily removed. For this same reason the cloth cannot be dyed, but it can be spun of colored glass and the color is absolutely fast and unchanging.

Up to the beginning of the sixteenth century the glass used in stained glass work was what is known as "pot metal," that is, it was colored in mass through its entire substance. Painting was only used to bring out the shading and fine line work, and the paint was always brown, which was afterward "fired" into glass. During the sixteenth century a rich yellow stain, obtained by the use of silver salts, came into use. It was also used upon blue glass to produce green effects. Shortly afterward the irregular depths of tint in the glass were first utilized to give modeling. The ruby glass used at this time was made by placing a thin layer of ruby "pot metal" upon the surface of a sheet of white glass and welding the two together by heat, as the ruby alone became opaque as soon as any thickness was reached. It soon occurred to some one to cut or grind away the ruby surface to produce white figures on the red ground. By staining the exposed portions, they were also able to get rich yellow and red contrasts. This led to extending the practice to other colored "pot metals," until a great variety of beautiful effects were produced.

When glass contains little or no lime it shows a marked tendency to become opaque upon cooling, probably owing to minute crystallization throughout its structure. The so-called alabaster glass is made by reheating glass of this kind and allowing it to cool slowly. Opalescent glass is that which possesses the same tendency in less degree. A good "mix," as it is called by glass workers, for alabaster glass is 100 parts of quartz sand, 45 parts of potash, 3 parts of calcined borax and 5 parts of silicate of magnesia.

CHICAGO DRAINAGE CANAL—ITS EFFECTS ON THE COMMERCE OF THE LAKES.

The Chicago drainage canal is an undertaking that bids fair to create a stir in at least half a dozen large divisions of the world's activity, whether it is ever opened or not. Both science and mere economics are viewing the engineering operations between the Chicago and the Desplaines Rivers, which undertake to neutralize the watershed between the Great Lakes and the Mississippi River, each with an interest peculiar to itself. The plan is, by means of the canal, to divert such an amount of the water of Lake Michigan into the Mississippi as to give the Chicago River a backward current sufficient to carry off the sewage of Chicago, the fall toward the lake not being sufficient to give the river any current of account and making it little more than a big slackwater sewer, a nuisance and an eyesore from every standpoint.

When the work was undertaken the city asked no questions. It arranged to take a certain definite amount of water out of Lake Michigan without so much as inquiring whether there were any rights infringed upon by the transaction. For awhile the marine interests looked on without taking any steps to protect its interests. Chicago writers and engineers for the most part assumed that there would be no lowering of the level of the lakes, but in this they were so generally opposed by engineers not interested in the city's wants that the government at length appointed a board of three engineers to inquire into the matter. The board consists of General Poe, stationed at Detroit, Major Ruffner, at Buffalo, and Captain Marshall, at Chicago. The time of meeting has not been set, but is expected to be during the present summer.

The estimates of the amount that the canal will lower the lake level vary from a matter of three inches to about nine inches. Finding that this limit was likely to cover the actual fact and finding, curiously enough, that there are no data by which anything short of the actual experiment itself is sufficient to settle the question, there was consequently a deep interest in the result to navigation from the loss of these depths of water. Major Ruffner, at the suggestion of President Frank S. Firth, of the Anchor line, the lake line of the Pennsylvania Railroad, asked Secretary C. H. Keep, of the Lake Carriers' Association, to make an estimate of the loss of carrying capacity to the lake fleet at lowered levels of three, six, and nine inches.

The work was very carefully done, and the accuracy of it in a general way is not to be doubted, for an actual consideration was made of all the lake craft that would be affected by the fall of water. Mr. Keep's conclusions are little short of startling. Without going over the long report, the following quotation will give the gist of it: "A lowering of the lake levels by three inches would produce a diminution of the carrying capacity to the lake fleet in a season amounting to 1,142,370 tons. A lowering by six inches would diminish the carrying capacity 2,284,740 tons. And a lowering of the lake levels amounting to nine inches would diminish the carrying capacity 3,427,110 tons. Turning these results into dollars and cents, and estimating the earnings of lake vessels at an average of 50 cents per ton of cargo carried, over and above cost of loading and unloading, a lowering of three inches would diminish the earnings of the fleet in a single year $571,-185; a lowering of six inches would diminish the earnings $1,142,370; and a lowering of nine inches would diminish the earnings $1,713,555.

The report concludes with calling attention to the fact that the tendency of the new tonnage is almost entirely in the direction of deeper draught, so that the loss would increase year by year. Major Ruffner regards the report as one of the most important documents of its kind and says that the showing is such that the lake interests could afford to furnish Chicago a plant for disposing of her sewage by the dry process rather than to allow the canal to be completed and used.

ANOTHER RACE OF CARRIAGES WITHOUT HORSES.

We chronicled not long ago a trial of speed in France between carriages propelled without horses, the results of which trial were not very satisfactory. We have now to record a second race of the same character, in which a number of vehicles took part.

This race began in Paris on June 11; the course was from Paris to Bordeaux and return. The distance was about 360 miles from Paris to Bordeaux. Under the conditions of the race only four-seated carriages could compete for the first prize of 40,000 francs, or $8,000. Special prizes were also to be awarded to automatic and petroleum velocipedes; 66 horseless vehicles propelled by petroleum, steam power or electricity and five or six petroleum bicycles competed. The preliminaries were arranged with great care, checking stations being provided to insure the integrity of the race. Special telegraph wires were laid along the route to transmit news of the progress of the race to Paris. The race was witnessed by many thousand people on the line of march. The first vehicle to arrive at Bordeaux was MM. Panhard and Levassor's petroleum carriage, which reached Bordeaux at 10:32 on Wednesday morning, the start having been made at Versailles at nine minutes past noon the previous day. A stop of only four minutes was made, when the return trip was begun. M. Levassor's time to Bordeaux was 22 hours 28 minutes over a distance of 585 kilometers (363 miles). The speed was 24 kilometers 400 meters per hour, equivalent to about 15 miles. Many of the vehicles met with accidents on the trip. Carriage No. 6 ran over a large dog, the result being that a wheel was broken and the vehicle upset. No. 14, a petroleum bicycle, caught fire and was obliged to be abandoned at Angouleme. Though the two-seated carriage (No. 5) of MM. Panhard and Levassor arrived first, it received only second prize, the first prize being taken by the four-seated carriage of Les Fils de Peugeot Freres; the third was taken by a two-seated vehicle by the same party, as was also the fourth, which was for a four-seated vehicle. The carriage of MM. Panhard and Levassor met with an accident shortly after leaving Bordeaux, which delayed it over an hour, which makes the run more creditable. This carriage made the entire trip in 2 days and 53 minutes for the round trip of 1,170 kilometers (727 miles), being at the average rate of 14·9 miles an hour. Many of the other vehicles made splendid time.

The contest was arranged by Mr. James Gordon Bennett, Baron de Neufeldt, and others, who it is said paid for the prizes. The automobile carriage of to-day is in its infancy, but with the stimulus of such races as the present for substantial monetary prizes, the development cannot fail to be rapid. When the machinery shall be still more simplified, we may expect to see the automobile carriage come into extensive use.

In this connection we give in another column illustrations of some of the earliest examples of steam carriages, continued use of which was prevented probably owing to the bad roads then existing. Fine roads are almost an essential for the successful working of this class of machinery.

Speed in Milling Work.

Mr. Oberlin Smith in a recent article on "Shops Economy," in Cassier's Magazine, says: "Do not allow a workman to think that 16 feet cutting speed per minute on soft cast iron is good enough, because he did it yesterday or last year, or because his grandfather did it. Show him by a definite object lesson that there is no trouble in doing a good deal of lathe, planer and drilling work at from 25 to 35 feet per minute, even when dry. Milling work may often be done very much faster than this, in some cases approaching 100 feet per minute, on account of many of the cutting edges being out of action and having time to cool. In certain special cases, where an abundant amount of lubrication can be forced constantly past the cutting edge of the tools, as in drilling deep holes in gun barrels, etc., speeds as high as 3,000 feet and over have been attained, and 1,800 feet per minute is a very common speed. All this goes to show what every workman ought to know and have drummed into him every day of his life, that there is no hidden mystery about a tool 'standing.' Let him understand, once for all, that a steel tool will cut chips off pieces of softer metal at any rate of speed desirable, provided it can be kept cool. Emphasize the fact that it is all a matter of temperature, and if the tool can be kept cool, mere velocity of cutting does not count against it." These important facts should be constantly kept in mind by those who are responsible for the machine shop practice in railroad shops. We are not exaggerating when we say that in some of these shops things move pretty slowly. Even the men get into a gait that corresponds more or less with the speed of their machines, and a more rapid movement of the latter would undoubtedly make the men more active also. It is worth trying, for there is economy in it.

St. Louis.

The authorities of the city of St. Louis, in recognition of the compliment paid to their metropolis by the naming of the great steamer St. Louis, made very generous and beautiful presents to the ship, among which were the following:

"1. A library for the first cabin, consisting of 1,622 carefully selected volumes, handsomely bound and numbered.

"2. A library for the second cabin, containing 639 volumes, also especially selected.

"3. Two hundred copies each of hymnals and prayer books, especially bound and bearing the names of the ship and the donors.

"4. Two handsomely bound albums, containing each fifty photographic views, with descriptive matter covering a brief history of the city and of each picture.

"5. A monograph descriptive of the new Union Station, donated by the president thereof.

"6. Ten ornamental glass windows for the first cabin library room; and

"7. A full set of flags, including the American ensign and the house flag in silk, and a burgee bearing the name St. Louis."

The American Society of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers will take place at Detroit, Mich., and will be held from June 21 to June 28. Arrangements have been made for visiting various engineering works and points of interest, such as the St. Clair tunnel, the works of the Public Lighting Commission, etc. A reception will be tendered by the citizens of Detroit to the society at the Detroit Club. A number of interesting professional papers will be presented. The president of the society is E. F. C. Davis; the secretary is F. R. Hutton, and the treasurer is William H. Wiley. The headquarters of the society are at 12 West Thirty-first Street, New York City.